CLAIMS

1. A method for the construction of a molecular deposition domain on a surface, comprising:

   (a) providing a surface;

   (b) depositing a deposition material on a deposition device;

   (c) depositing the deposition material on the surface using said deposition device, forming a molecular deposition domain smaller than one micron in total area.

2. The method of claim 1 wherein depositing the deposition material on the deposition device further comprises:

   (d) placing the deposition device in contact with the deposition material to be deposited;

   (e) exposing the deposition device and the dried deposition material to a humid gas so that a capillary bridge is formed between the deposition device and the deposition material;

   (f) retracting the deposition device, retaining a portion of the deposition material on the deposition device.

3. The method of claim 2 further comprising drying the deposition material on the deposition device.

4. The method of claim 1 wherein depositing the deposition material on the deposition device further comprises:

   (g) preparing a solution of the deposition material;

(h) placing the deposition device in the solution containing the deposition material;

(i) removing the deposition device from the solution, retaining a small portion of the solution on the deposition device;

(j) drying the solution containing deposition material on the deposition device.

5. The method of claim 1 wherein depositing the deposition material on said surface further comprises:

(k) placing the deposition device in a position adjacent to the surface;

(l) exposing the deposition device and the surface to a humid gas so that a capillary bridge is formed between the deposition device and the deposition material;

(m) withdrawing the deposition device from the position adjacent to the surface, leaving a portion of the deposition material on the surface in a deposition domain smaller than one micron in area.

6. The method of claim 5 wherein withdrawing the device further comprises exposing the deposition domain, the surface, and the deposition device to a dry gas to sever the capillary bridge.

7. The method of claim 1 wherein depositing the deposition material on said surface further comprises:

(a) touching the deposition device with the deposition material on it to the surface;

(b) exposing the deposition device and surface to a humid gas so that a capillary bridge forms between the deposition device and the surface;

(c) retracting the deposition device from the surface leaving a deposition domain on the surface.

8. The method of claim 7 wherein withdrawing the device further comprises exposing the deposition domain, the surface, and the deposition device to a dry gas to sever the capillary bridge.

9. The method of claim 1 wherein providing the surface further comprises coating the surface with a sputtered layer of gold

10. The method of claim 1 wherein providing the surface further comprises chemically modifying said surface with a reactive material.

11. The method in claim 1 wherein the molecular deposition domain is a line.

12. The method in claim 1 wherein the molecular deposition domain is a spot.

13. The method in claim 1 wherein the molecular deposition domain is an irregular shape.

14. The method in claim 1 wherein the molecular deposition domain is a regular shape.

15. The method of claim 1 wherein said surface is chosen from one or more of the group consisting of a hydrophobic surface, a hydrophilic surface, and a chemically modified surface.

16. The method of claim 1 wherein said surface is chosen from one or more of the group consisting of a polymer and a metal.

17. The method of claim 1 wherein preparing said surface further comprises modifying the surface with one or more of the group consisting of an amino group and a carboxyl group.

18. The method of claim 1 wherein said surface is physically modified.

19. The method of claim 1 wherein said surface is physically modified with a metal.

20. The method of claim 1 wherein said surface is chosen from one or more of the group consisting of mica, silicon, glass, and quartz.

21. The method of claim 1 wherein said deposition material is chosen from one or more of the group consisting of proteins, antibodies, succinimides, nucleic acids, DNA, RNA, silanes, and alkanethiolates.

22. The method of claim 1 in which said deposition material is an individual long chain molecule.

23. The method of claim 1 wherein depositing the sample on the surface further comprises immobilizing the material on the surface by reacting the deposition material with a chemically modified surface.

24. The method of claim 1 wherein the immobilized molecules are chosen from one or more of the group comprising nucleic acids, proteins, lipids, sugars, organic, and inorganic chemical groups.

25. The method of claim 1 wherein the deposition device is a scanning probe microscope probe.

26. The method of claim 1 wherein the deposition device further comprises an attached microsphere.

27. The method of claim 26 wherein the microsphere is up to 25 microns in diameter.

28. The method of claim 26 wherein the microsphere is larger than 25 microns in diameter.

29. The method of claim 26 wherein the microsphere is made of a non-porous material.

30. The method of claim 26 in which the microsphere is made of a porous material.

31. The method of claim 26 in which the microsphere is made of glass.

32. The method of claim 1 wherein the deposition instrument is automatically controlled by a computer.

33. The method of claim 1 wherein depositing the deposition material on the deposition device further comprises regulating the humidity surrounding the deposition device and the surface.

34. The method of claim 1 further comprising using photons to activate a chemical group on the surface to enable tethering molecules within a specific domain defined by the area of irradiation.

35. The method of claim 34 using photons in the far field.

36. The method of claim 34 using photons in the near field.

37. The method of claim 34 in which the surface is photosensitive.

38. A method for constructing an array of molecular deposition domains comprising

(a) providing a surface;

(b) providing an at least one deposition material;

(c) depositing a first deposition material on a deposition device;

(d) depositing the first deposition material on the surface in a known position, forming a first molecular deposition domain smaller than one micron in total area;

(e) cleaning the deposition device;

(f) repeating the above steps to form an at least one other deposition domain, creating an array of two or more deposition domains on said surface.

39. The method of claim 38 wherein cleaning the deposition device further comprises

(a) inserting the deposition device into a solution;

(b) vibrating the deposition device at a sufficient rate so that the deposition device is sonicated;

(c) removing the deposition device from the solution.

40. A method for detecting a target sample, the method comprising:

(a) forming a molecular array on a surface, the molecular array including an at least one molecular deposition domain, said at least one molecular deposition domain smaller than one micron in total area;

(b) exposing the surface to a sample medium, the sample medium containing one or more target samples which cause a molecular interaction event in one or more of the at least one deposition domain;

(c) scanning the surface using a scanning probe microscope to detect the occurrence of the molecular interaction event caused by the target sample.

41. The method of claim 40 wherein the sample medium is chosen from one or more of the group consisting of gasses and liquids.

42. The method of claim 40 when the deposition device is a mechanical member with force feedback.

43. The method of claim 42 when the mechanical member is hydrophobic.

44. The method of claim 42 wherein the mechanical member that is hydrophilic.

45. The method of claim 40 wherein the scanning probe microscope is an atomic force microscope.

46. The method of claim 40 wherein scanning the surface comprises scanning the deposition material directly for changes caused by the exposure to the medium.

47. The method of claim 40 wherein scanning the surface further comprises scanning for target samples introduced into the molecular deposition domains.

48. The method of claim 40 wherein scanning the surface further comprises searching for height changes in an at least one deposition domain.

49. The method of claim 40 wherein scanning the surface further comprises searching for shape changes in an at least one deposition domain.

50. The method of claim 40 wherein scanning the surface further comprises searching frictional changes in an at least one molecular deposition domain.

51. The method of claim 40 wherein scanning the surface further comprises searching for elasticity changes in an at least one molecular deposition domain.

52. The method of claim 40 wherein scanning the surface further comprises measuring direct molecular force measurement changes in an at least one molecular deposition domain.

53. The method of claim 40 wherein scanning the surface further comprises scanning in a flow-through format.

54. The method of claim 40 in which the target sample is chosen from one ore more of the group consisting of an atomic species, an organic compound, an inorganic compound, a biomolecule, and a chemical.

55. The method of claim 40 in which the target sample is chosen from one or more of the group consisting of an inhibitor, an enhancer, an attenuator, and a modulator.

56. A molecular array for characterizing molecular interaction events, comprising:

(a) a surface; and

(b) an at least one molecular deposition domain deposited on said surface wherein the spatial address of the domain is less than one micron in area.

57. The molecular array of claim 56 wherein the at least one molecular deposition domain is a line.

58. The molecular array of claim 56 wherein the at least one molecular deposition domain is a spot.

59. The molecular array of claim 56 wherein the at least one molecular deposition domain is an irregular shape.

60. The molecular array of claim 56 wherein the at least one molecular deposition domain is a regular shape.

61. The molecular array of claim 56 wherein the at least one deposition domain is deposited at a known location.

62. The molecular array of claim 56 wherein the molecular deposition domains are affixed to the surface in a high density format.

63. The molecular array of claim 56 wherein the surface is modified by one or more of the group consisting of gold, an amino group, a carboxyl group, and polymers.

64. The molecular array of claim 56 wherein the deposition material is one or more of the group consisting of proteins, antibodies, nucleic acids, succinimides, DNA, RNA, silanes, alkenethiolates, biomolecules, and inorganic compounds.

65. The molecular array of claim 56 wherein the surface is chosen from the group consisting of hydrophobic materials and hydrophilic materials.

66. A method for the processing of an array comprising:

(a) forming an array on a substrate, the array comprising a plurality of deposition domains formed of a deposition material;

(b) exposing the array to one or more materials which contain an at least one target sample that causes a molecular interaction event with one or more of the deposition samples; and

(c) scanning the array utilizing a scanning probe microscope to characterize the molecular interaction events that have occurred between the target sample and the deposition material.